INTRATHORACIC TUMOURS.

A REVIEW OF THE LITERATURE AND A STUDY OF THIRTY FIVE CASES OF PRIMARY INTRATHORACIC CANCER.

APPENDIX.

by

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INTRODUCTION.

In the limited time which was available after completing the review of the literature on primary intrathoracic tumours it was thought that it would be of interest to compare an analysis of the cases which had been submitted to post-mortem examination at the Royal Infirmary, Edinburgh, with the findings which have already been recorded at length. In view of the shortness of time it was accordingly decided to limit the series to those cases which had occurred in the period of five years from March 1926 to March 1931. As the record of one case at the end of this period was not available that of the last intrathoracic tumour occurring prior to March 1926 was included. Only those cases are considered in which diagnosis was established at autopsy and where histological verification was obtained. The clinical features have been studied in detail, but for purposes of brevity and in order to avoid a confusing mass of detailed information only the relevant features of each case have been recorded. In most instances the microscopical sections were examined personally and microphotographs of cases (4), (2), and (9) have been reproduced as examples of different histological types.
CASE REPORTS.

(1) J.V., aged 40. Ship's Cook.

In September 1930 the patient sustained an accident to his pelvis and has not been in normal health since. In October he developed a severe cough with some sputum and at times blood. About December a swelling was noted above the right clavicle. He complained of severe pain in the right side of the chest passing down the right arm. Later he was troubled by vomiting and weakness. There was an old history of syphilis. He was admitted to hospital on 30.1.31 in a weak condition. Dyspnoea and cyanosis became severe before death on 16.2.31. Shortly after admission X-ray showed complete obscurity of the right lung field with displacement of the heart and trachea to the left, the appearance being that of a large effusion. Wassermann Reaction was weak positive.

Post-mortem findings. Well developed and nourished. The left pleura contained several ounces of serous fluid. A mass of firm white tissue filled the mediastinum involving the trachea and oesophagus and replacing most of the right lung, at the hilum of which were rounded masses whence the growth seemed to originate. Left lung was not involved and there was no/
no metastases other than the supraclavicular glands. Microscopic examination showed masses of cells round and ovoid in shape with large oval nuclei arranged side by side in rows and circles. Mitosis was evident. Pathological diagnosis - Bronchial carcinoma of "oat seed" type.

(2) Mrs E.B., aged 53. Housewife.

During the last week of February 1930 the patient caught a severe cold. In March she began to complain of cough and pain in the chest. These symptoms improved after treatment but shortness of breath and tightness in the chest persisted. After admission to hospital on 14.4.30 sixty ounces of straw coloured fluid were removed from the left side. Examination showed lymphocytes and endothelial cells. Fluid re-accumulated persistently and was aspirated in considerable quantities on eight occasions before death on 2.5.30. Provisional Diagnosis - Malignant Pleural Effusion.

At post-mortem examination. Emaciated, the parietal pleura on the left side was found to be unduly thickened. The left half of the diaphragm was elevated, thickened, and stiff, and the peritoneum on the under surface appeared thick and pearly. The pericardium was/
was adherent to the pleura. There was a considerable quantity of blood stained fluid in the left pleural cavity and both visceral and parietal surfaces were shaggy in appearance. The left lung was about the size of a fist and almost completely collapsed except where the upper lobe was adherent to the third rib over an area 3" x ½". There was a thin cord-like adhesion from the lung to the pericardium. At the point of entrance of the left bronchus into the lung there was a firm white scirrhous tumour about the size of a golf ball surrounding the bronchi and almost obliterating the lumina producing atelectasis. There was no extensive infiltration, no infection of the lung, and no involvement of the pleura or other organs. Microscopic examination showed epithelial cells of squamoid type with well stained nucleus and granular cytoplasm. There was no definite arrangement of the cells.

(5) D.B., aged 42. Schoolmaster.

In January 1931 the patient complained of weakness and lassitude. Towards the end of this month he developed a cough and pain in the chest and in the right shoulder, boring in character. The cough was at first dry and later he began to bring up a small quantity of sputum but there was no blood. He lost weight/
weight steadily and since the middle of February he
had noticed his voice to be husky. On 1.3.31 when
moving in bed he was seized by a sudden pain in the
back and fainted. He was admitted to hospital on
2.3.31 when he was found to have complete paralysis of
both legs and loss of sensation up to the level of the
umbilicus. There was incontinence of faeces and urine.
A radiogram showed collapse of the right lung, the heart
being displaced to the right. Death occurred on
15.3.31.

Post-mortem findings. Emaciated. Lower half of right
pleura filled with green turbid fluid and extensive
collapse of lower lobe. Upper right lobe bound down
by malignant pleurisy. Three large masses in retro-
pleural tissue involved 9th, 10th, and 11th ribs close
to vertebrae, and 9th vertebra compressing the cord
extradurally. Upper and middle lobes involved by pale
grey mass extending from hilum to pleural surface.
Hilar nodes and mediastinal glands involved. Left
lung unaffected. Lymphatic permeation of visceral and
parietal pericardium. No invasion of heart. Liver
and spleen not involved. Nodules in head, body, and
tail of pancreas and in a gland at head. Both kidneys
small; nodules at cortex. Brain not affected. Mass
of glands above right clavicle.

Microscopical Report - Definite carcinoma arising from
bronchial/
bronchial mucosa. Cells on the whole are undifferentiated, round or polyhedral. However, development from columnar cells could be seen.

(4) S.H., aged 31. Miner.

In January 1929 the patient caught a chill and complained of a sharp stabbing pain in the front of the chest on inspiration and on coughing. The pain persisted and he had a cough producing thick yellow sputum. He continued to work until March 1930 though he never felt well. In April 1930 the sputum contained streaks of blood and he became breathless and lost weight. The pain has become gradually more severe shooting over the right side and keeping him awake at night. He has usually sweated profusely at night during the month prior to admission. He was admitted to hospital on 19.5.30. The percussion note was resonant throughout the chest. A small hard tender subcutaneous nodule was situated in the second right interspace. Wassermann negative. The X-ray appearance suggested an old inflammatory condition. There was an opacity in the anterior mediastinum and the shadow above the heart appeared abnormally broad. The pain became agonising and pericarditis developed as a terminal feature before death on 6.6.30. Provisional Diagnosis - Mediastinal Tumour.

Post-Mortem findings. Some emaciation. The right pleura/
pleura was partially obliterated by a large mass of malignant tissue, which was present also on the anterior portion of the cavity and spreading into the mediastinum. The remainder of the cavity was filled with blood stained fluid. The pericardium was infiltrated and contained dark brown fluid. Section of the mediastinum showed a large mass involving the glands and extending into the lung from the right hilum. There was deeper invasion of the lower lobe along the lymphatic vessels. The left lung was not involved. The liver was enlarged and showed chronic venous congestion. The head and most of the tail of the pancreas were replaced by white structureless malignant growth. A small pin point white nodule was situated in the cortex of the left kidney and the paraaortic glands showed malignant involvement. Microscopic examination of the nodules in various organs showed the presence of a lymphosarcoma. See Plate.


The patient developed an attack of pleurisy at the beginning of March 1930 and was in bed for nearly a month. He was subsequently sent to a sanatorium where he remained until the end of April and was treated with ultra violet radiation. He kept well for six weeks and then became breathless on exertion with asthmatic/
asthmatic attacks. He became increasingly weak, sweated at night and lost weight. In July an effusion was noted in the right pleural cavity and sterile fluid was aspirated. The attacks of asthma increased in severity and he was admitted to hospital on 26.8.30. On 2.8.30 a radiogram had shown obscurity of the lower half of the right hemithorax with increased shadow of the lung area above. There was no deviation of the trachea. Wassermann Reaction negative. Aspiration of the right pleural cavity was carried out on four occasions the fluid being sterile on each occasion. Death occurred on 8.9.30. Provisional Diagnosis - Tuberculosis.

Post-mortem Report. Well developed. Well nourished. Right pleura contained old fibrous adhesions above and newly organised exudate below. The lower two thirds of the right lung were occupied by new growth which infiltrated the lower parts of the right bronchus completely obliterating the lumen for 1\(\frac{1}{2}\) inches from its commencement and extended into the mediastinum as far as the root of the left lung. The latter showed oedema but no other involvement. The tumour invaded both auricles and lay bare within the heart. The left suprarenal was the site of a metastatic nodule. Histological examination showed cells of "oat seed" form in irregular masses lying in a fine stroma. Here and there more definitely columnar cells arranged in rows indicated origin from bronchial epithelium.

During the last week of September 1930 the patient was in bed for a week suffering from an attack of bronchitis. About a month later he was again confined to bed with a pleural effusion. He complained of weakness and loss of appetite and that his tongue felt "thick". He lost weight and strength and was admitted to hospital on 18.12.30. He was found to have left hemi-atrophy of the tongue. Palpable swellings under the costal margin and in the left iliac fossa disappeared after the bowels moved. X-ray of the chest showed some rib collapse on the left side and a mass at the left hilum. Radiograms of the alimentary tract gave no positive information. Blood examination - White blood cells 13,900. Wassermann reaction negative. He became very weak and developed incontinence of faeces a week before death on 31.12.30. Provisional Diagnosis - Carcinoma of the Stomach.

Post-mortem findings. Emaciation. Left pleural cavity contained six ounces of turbid fluid. A mass of malignant tissue with a number of soft yellow areas of necrosis was situated at the root of the left lung involving the mediastinal glands and invading the lung for 2" - 3" along the main bronchus. There was no ulceration of the mucosa. Metastases were present in the liver, in the body and tail of the pancreas, and in the right suprarenal. There was no naked eye evidence/
evidence of involvement of the brain or of the course of the hypoglossal nerves. Microscopic examination of the tumour showed the composition to be mostly of cells of spindle shape or rounded in masses between bands of firm vascular stroma. At the periphery the cells are larger, polygonal, or cubical and frequently arranged in rows or in irregular acini or tubules. Giant cells with single large irregular nuclei are scattered throughout the growth and mitotic figures are common. The metastases showed a similar structure.

(7) J.M., aged 49. Woodyard Worker.

The patient became ill in August 1930 and lost appetite. He developed a cough with some sputum, abundant and of a yellow colour. He became extremely sleepy and had continuous fever. He is said to have had a slight chronic cough with a little sputum ever since the Boer War. He developed pain between the shoulder blades, and his doctor aspirated his chest twice during November. He was admitted to hospital on 11.12.30. Exploration of the chest produced a small amount of blood stained fluid. Fever was continuous and there were spasms of breathlessness. No tubercle bacilli could be found in the sputum. Death occurred on 29.12.30. Prov. Diagnosis. Carcinoma of/
of the lung.

Post-mortem Report. Well developed and well nourished. The right pleura was thickened. The right lower lobe was riddled with small bronchiectatic cavities, the lung tissue between being in parts oedematous and in parts consolidated. Close to the bifurcation of the right main bronchus a pedunculated neoplasm was seen to be attached to the mucous surface obstructing the lower branch bronchus and to a lesser extent the upper one. The left lung was normal apart from old bronchiectasis of the lower lobe. The mediastinal glands were found on microscopic examination to be free from involvement. There were no metastases. Histological examination of the tumour showed a carcinoma arising from the bronchial mucosa and exhibiting well marked squamous metaplasia. There were no signs of acini.

Mrs A.W., aged 58. Housewife.

In October 1929 there was an attack of influenza but no cough. A month later she developed acute mastoiditis and operation was performed in hospital. During convalescence there was some cough and a little sputum. This persisted until July 1930 by which time there was no sputum but she was breathless and complained of a sharp pain passing from the sternum through to the back. Dyspnoea increased. At the middle/
middle of October there was a frank haemoptysis. She remained in bed for five weeks and was breathless and weak. By admission to hospital on 26.11.30 she had lost two stones in weight. On 29.11.30 radiogram showed complete obscurity of the left side of the chest. Fluid was aspirated on 7.12.30 and on 10.12.30 from which a haemolytic streptococcus was grown on culture. Wassermann Reaction - strong positive. She went downhill and died on 1.12.30. Provisional Diagnosis - Carcinoma of the lung.

Post-mortem findings. Slightly emaciated. Left pleura was almost full of semipurulent fluid and the pleural surface of the left lung was covered by a fibrinous exudate. A tumour was present and seemed to arise from the upper lobe bronchus of the left lung involving the tissue at the hilum for about a square inch on section. Spread had occurred by the lymphatics to the base of the lower lobe with subpleural involvement and the formation of a mass in the lower lobe. There was no evidence of spread to the right lung. There was marked involvement of the bronchial and mediastinal glands and of the cervical glands of the left side. The right suprarenal was the only other site of metastasis. Microscopic examination of the tumour showed cells of columnar type with transition to oat cells. The alveoli showed the catarrh of pneumonia.
(9) T.S., aged 66. Retired Shipwright.

Since June 1930 the patient has complained of "bronchial asthma". Since August he has become progressively weaker and breathless on exertion. He went to bed on 29.11.30 dyspnoeic and with pain in the left side of the chest. He was extremely ill on admission to hospital on 9.12.30 and died the same day.

Post-mortem Report. Poorly nourished. Both pleural cavities were interrupted by firm fibrous adhesions most marked on the left side. In the mediastinum there was a rounded mass of tumour at the root of the left lung under the arch of the aorta. The oesophagus and aorta had produced grooves in the mass. The main left bronchus and branches were narrowed by ulceration by the malignant growth and the left lung was largely collapsed. The bronchi were dilated and contained a large amount of purulent material. The malignant mass was dense white with small areas of necrosis and had invaded the left lung diffusely, the root glands and the pericardium. The right lung showed emphysema and bronchitis. The colon evidenced diverticulosis. There were no metastases. Histological section showed cells varying in size with many characteristic oat cells, having hyperchromatic nucleus and scanty cytoplasm, and round cells. No acinar formation could be seen and no cylindrical cells were evident. Carcinoma was of the oat cell type. See Plate.

Since May 1929 the patient has become thinner, has felt weak and has suffered from attacks of dizziness. There were no other symptoms and she refused to entertain thoughts of medical attention. On 26.8.29 she collapsed while at work and was admitted to the wards. The left side of the chest was dull on percussion and X-ray showed a complete obscurity of the left lung field. Aspiration of a small amount of blood stained fluid was carried out. She became steadily weaker and coughed up a quantity of foul smelling sputum two days before death on 14.9.29.

Provisional Diagnosis - Tumour of the left lung.

Post-mortem report. Emaciation. Left pleural cavity contained a few ounces of blood stained fluid. A large firm tumour in the mediastinum infiltrated the left lung and caused narrowing of the lumen of the left bronchus. In the lung there were tumour nodules and bronchiectasis was evident. The whole lower lobe was necrotic. The mediastinal portion was firmly adherent and compressed the left pulmonary artery and vein and the arch of the aorta. The mediastinal glands were enlarged and surrounded by new growth. There were no other metastases. Histological section showed numerous columnar cells, many assuming a squamous form. There was much evidence of mitosis. Pathological Diagnosis - Columnar celled carcinoma of the bronchial mucosa.

At the beginning of 1929 the patient had an attack of bronchitis. This was followed by constant weakness, breathlessness, and some pain in the right side of the chest. She was treated in a hospital for five weeks during July and August and eventually admitted to the Royal Infirmary on 4.1.30 when there was dullness on percussion over the right upper lobe where X-ray showed an opacity. She complained of constant weakness. On 27.1.30 the blood examination showed R.B.C's 4,250,000; white cells 15,800.

Two weeks later a radiogram showed evidence of paralysis of the diaphragm. There was some cough with scanty sputum. Thoracentesis produced a small amount of blood stained fluid. A swelling appeared over the left fibula and X-ray showed erosion of the bone. During the month in hospital she lost only 1 lb. in weight.

Two applications of deep X-rays were given. Towards the end pleural effusion was noted. Death occurred on 1.2.30. Provisional Diagnosis - Tumour of lung. Post-mortem findings. Well developed well nourished woman. Terminal purulent pericarditis. The right lung showed a mass of tumour growth at the hilum infiltrating the upper lobe. The primary growth appeared to be on the anterior aspect of the wall of the main bronchus, the wall being infiltrated over an/
an area the size of a penny between the cartilage rings
producing a prominence of the submucosa almost com-
pletely occluding the upper bronchus and causing
bronchiectasis of the upper lobe. There was a necrotic
area in the upper lobe. The remainder of the lung was
slightly collapsed. The pleural cavity contained four
or five pints of clear serous fluid and several nodules
were evident on the parietal pleura of the upper lobe.
The left lung contained several nodules scattered in
the lung mostly towards the periphery. Many small
malignant nodules were scattered in the peritoneum and
in the mesentery. A large fusiform mass showing well
marked lobulation involved the middle third of the
fibula and the adjacent muscles. There were no other
metastases. Histological examination showed irregular
masses of irregular columnar cells occurring in rows
and forming atypical acini in places. The peritoneal
tumours had a similar appearance and the metastasis in
the fibula was composed of masses of cells separated
by fibrous septa; the cells at the periphery were
arranged in rows along fibrous strands. Mitosis was
evident in all sites.
J.G., aged 67. Retired Quarry Foreman.

Cough was first developed in May 1929 and persisted with a good deal of sputum, at times blood stained. The illness began as a severe chill with fever and haemoptysis which confined him to bed for a month. During the summer he lost half a stone in weight and in November breathlessness became troublesome. He was admitted to hospital on 3.12.29 and found to have a pleural effusion. Radiogram showed diffuse marked fibrosis throughout both lung fields, most marked on the left side; retraction of the left lung with fluid at the base; no evidence of cavity. Fluid was aspirated and the patient improved. He was discharged for convalescence on 7.1.30 but was readmitted on 4.3.30 the condition being much worse with physical signs of a cavity in the right upper lobe. No tubercle bacilli were found. Wassermann Reaction negative. Acute oedema of the lungs occurred and death followed on 30.3.30. Provisional Diagnosis - Silicosis, Pulmonary Tuberculosis.

Autopsy Record. Some emaciation. In the left pleural cavity there were old adhesions above and greenish yellow pus below. Just beyond the origin of the left bronchus there was a mass of hard whitish neoplastic tissue, 3.5 cm. in diameter, projecting into the lumen and invading the neighbouring lung. The lower part of the/
the left lung was collapsed and airless. Both lungs showed numerous hard white nodules scattered throughout their substance and also over the pleural surfaces. Both lungs were deeply pigmented with carbon and the apices showed emphysema. There was no evidence of tuberculosis. There were no other metastases. Sections from the silicotic part of the lung showed numerous fibrous nodules, many of which surround pure granules of silica, others being unassociated with deposits. No sign of active tuberculosis. The remainder of the lung shows peribronchial fibrosis. The tumour is composed of epithelial cells mostly polyhedral in shape but columnar at the outer parts. In some areas where the tumour is apparently continuous with the epithelium lining the bronchus a moderate degree of squamous metaplasia is evident. Mitotic cells and malignant giant cells are abundant. In some parts imperfect acini are visible. The tumour probably originated from the lining epithelium of the bronchus.


In April 1929 the patient developed a cough and pain in the right side of the chest. The pain was "cutting" in type and became less severe after a few days. The cough persisted with a good deal of sputum. In August the pain returned and he complained of weakness/
weakness, loss of weight and sweating at night. He was admitted to hospital on 26.10.29 with acute pleurisy. He was sent to the City Hospital for treatment in the fresh air and later went home. He was readmitted to hospital on 16.12.29 with cough, sputum and oedema of the face. The urine contained albumen and pus. He went rapidly downhill and died on 18.12.29.

On 29.10.29 the X-ray report of his chest was: increased density at the right hilum and an area of increased density at the right base, suggesting an inflammatory lesion. Wassermann Reaction - negative. Provisional Diagnosis - Tuberculosis of the Lung and Pleurisy.

Post-mortem Findings. Emaciated and oedematous. The right pleural cavity showed adhesions at the apex and contained purulent fluid. A firm white tumour occupying the mediastinum apparently originated from the first part of the right bronchus spreading into the right lung, enclosing but not compressing the pulmonary artery. There was an outgrowth in the wall of the right auricle. The mediastinal glands were infiltrated and an outgrowth the size of a golf ball was situated at the hilum of the left lung. The right bronchus was obstructed so that a pencil could only be passed with difficulty. The right, middle and lower lobes showed saccular bronchiectasis and broncho-pneumonia while the upper lobe was collapsed. There were/
were no other metastases. Section of the tumour showed large deeply staining irregularly shaped cells with relatively little cytoplasm. In places attempts at tubule formation could be seen and a fair amount of fibrous tissue was present. Pathological Diagnosis. Bronchial Carcinoma of "oat seed" variety.

(14) F.G.J., aged 47. Letter Press Printer.

Since June 1929 there has been complaint of shortness of breath and weakness, and since the last week of this month the patient has been confined to bed. There has been some cough with sputum, which was at times streaked with blood, and some palpitation. There have been occasional headaches and the appetite has been poor. He has become thinner except "round the middle" and has lost a good deal of weight. At the beginning of November the feet became swollen and later swelling of the left elbow occurred. There has been indigestion for years. He was admitted to hospital on 8.11.29. X-ray showed the presence of an effusion, the left hemithorax presenting a dense shadow and the heart and trachea displaced to the right. Wassermann Reaction - negative. The chest was explored on three occasions, with little result on the first two and eight ounces of blood stained fluid on the/
the third attempt. Death occurred on 18.11.29 after a week in hospital. Provisional Diagnosis - neoplasm of lung.

Post-mortem findings. Emaciation. The left pleural cavity was obliterated by thick fibrous adhesions \(\frac{3}{4}\)" thick over the surface. The patent portion contained greenish yellow purulent material. In the upper lobe and occupying the upper part of the lower lobe a tumour extended from the hilum. At the point of division of the left main bronchus a nodule appeared on the interior showing ulceration of the mucosa. Invasion was more apparent in the branches and the lumina were considerably reduced. The tumour showed several opaque areas of necrosis. Solid masses surrounded the large vessels and bronchi and there was peripheral extension along the lymphatics. The lower lobe was compressed, collapsed and bronchiectatic. The tumour had invaded the pericardium and the left auricle. There were metastases in the lymph glands and the head of the pancreas was replaced by firm tumour tissue. Histological examination showed cells of the "oat seed" type varying in size, some elongated, others rounded, larger, and in places polyhedral. There was little cytoplasm and the nucleus stained deeply showing a rich chromatin network. There was little structural arrangement and a fair amount of fibrous tissue was present.

Pathological Diagnosis - Oat celled bronchial carcinoma.
(15) T.M., aged 18. Copper Smith.

In July 1927 tonsils and adenoids were removed and the patient was well on discharge. Two weeks later on 23.7.27 he was admitted to the medical wards complaining of pain in the right side of the chest. Slight cough and sputum. There were signs of a cavity in the right lower lobe. Bronchography showed defective entry of lipiodol into the finer bronchi and enlarged bronchi of the right lower lobe. On 23.8.27 he had improved and was discharged to the convalescent home. Two years later he was readmitted complaining of weakness and lassitude. There was only slight cough and no sputum, but a mass of enlarged glands was present above the right clavicle. Dyspnoea increased and became suddenly worse on 30.10.29 when he was transferred for bronchoscopy. The right lung collapsed and he became moribund. The bronchoscope could not be passed beyond the bifurcation of the trachea where there was obstruction due to a reddish swelling. He died a few hours later.

Post-mortem findings. Long thin youth. Large tumour mass in mediastinum involving all glands, firm and white with areas of necrosis. Involvement of root, left upper lobe and apex of lower lobe. The blood vessels were compressed, and the right lung was involved only at the root of the upper lobe. In the left lower lobe there were radiating white streaks and numerous small/
small white nodules. The liver showed many well defined flattened secondary nodules 1.5 - 2 mm. in diameter and a metastatic growth was present in the head of the pancreas. Histological examination evidenced masses of cells with rounded or elongated nuclei and comparatively little cytoplasm. In areas some of these cells could be seen developing from columnar cells. Bands of fibrous tissue were numerous. The metastases had a similar appearance. Pathological Diagnosis - Oat seed type of bronchial carcinoma.


In March 1929 the patient was forced to stop his work owing to an attack of lumbago. He resumed work and remained well until he developed a sudden attack of pain in the back, "like knives sticking into him", when at work at the beginning of June. This attack lasted for nine hours. He suffered from periodic bouts of this kind of pain until the end of August when the pain began to radiate down his legs and he complained of cramp-like feelings and "pins and needles" in his legs. He is said to have lost three stones in weight during the summer. He was admitted to Hospital on 15.9.29 with paresis of both legs, sensory disturbance and pain in the lumbar region. Paralysis became complete/
complete with incontinence, Cheyne Stokes breathing, and pyrexia before death on 29.9.29.  Provisional Diagnosis - Tumour of the Cord.

Post-mortem findings. Poorly nourished. Right pleura obliterated by adhesions. Adhesions at the posterior border of the left pleura. At the root of the upper right lobe was a hard mass spherical in shape, with a diameter of 2", infiltrating the lung along the smaller bronchi. The centre was softer. Both visceral pleurae, more especially the right, showed white nodules \( \frac{1}{5} \) in diameter situated within the pleura and not appearing to infiltrate the lung. The liver contained three small growths. The left suprarenal was infiltrated by a nodule at the cortex. The right lobe of the thyroid was replaced by white neoplastic tissue. Secondary growth had caused necrosis of the upper thoracic and middle lumbar vertebrae, the transverse processes being most affected. The right ilium showed several areas of growth, and the cortex of the left kidney was involved. The cord was flattened at various levels and had an antero-posterior diameter of only 3 mm. in the lower dorsal region. There was no invasion. Microscopical examination showed the lung tissue to be replaced by malignant cells with large rounded well-stained nuclei. These filled the alveoli in the outer parts of the tumour. There was no definite arrangement/
arrangement but acini were formed in a few areas by cells with rather larger nuclei. These and the cells lining the bronchioles were as a rule more than one layer deep. The bronchial glands had a similar appearance. The iliacus muscle was invaded. The liver nodules showed no arrangement of cells but alveoli were seen in one area of the thyroid. Four isolated thoracic vertebrae and the 3rd lumbar vertebra were invaded by closely packed cells and had collapsed. Pathological Diagnosis - Tumour of oat seed type arising from the bronchial mucosa; lack of definite arrangement indicating a high degree of malignancy.


The patient had suffered from chronic bronchitis since the age of seven, and had had a cough with sputum every winter. In 1923 he had pleurisy and nephritis. In June 1929 he had an attack of influenza since when he has complained of continuous cough, with about two ounces of offensive purulent sputum daily, and of sweating at night. He was admitted to hospital on 27.8.29 when there were signs of chronic bronchitis. A radiogram showed a tumour spreading from the right hilum into the lung. Wassermann Reaction - negative. He lost weight and while in hospital had a slight haemoptysis. There were periodic attacks of dyspnoea for/
for three days before death on 12.9.29. Provisional
Diagnosis - Pulmonary Tumour.

Post-mortem findings. Slight emaciation. Right pleural
cavity obliterated by thick chronic adhesions. A well
defined tumour at the hilum about 4" in diameter
enveloped certain of the bronchi and branches of the
pulmonary vein and spread to the middle of the right
upper lobe. The right hilar glands were involved.
There were no other metastases. Both lungs showed
bronchitis and bronchopneumonia. Sections showed the
primary tumour to be of the oat seed type arising from
lining cells of the bronchi and in certain areas
development of these cells from typical columnar cells
could be seen.

(18) J.R., aged 56. Labourer.

A carbuncle prevented him from working in March
1929 but he was otherwise in normal health until the
beginning of June when he complained of a pain in the
chest shooting down the inner side of the arms. These
spasms were sometimes agonising, lasted for a quarter
of an hour and occurred two or three times a week.
During the second week in June he was troubled with
shortness of breath and with cough. He brought up a
good deal of watery sputum. He was admitted to hospital
on/
on 11.7.29. X-rays showed obscurity of the left side of the thorax. Wassermann - negative. Dyspnoea became steadily worse and he died on 23.7.29. Provisional Diagnosis - Mediastinal Tumour.

Post-mortem Report. Moderate emaciation. The lower three inches of the trachea were markedly compressed from side to side and the lower deep cervical glands on both sides were extensively infiltrated. A large mass in the mediastinum involved mainly the upper lobe of the left lung which was invaded, with compression of the left bronchus, pulmonary artery, trachea, and also narrowing the lumen of the right bronchus by pressure. The lumen of the left bronchus showed nodular projections. The tumour was lobulated, greyish white in colour with yellow streaks of necrosis. There was bronchiectasis of the left upper lobe and the right lung was the site of bronchitis and emphysema. There were no metastases. Histological examination showed a bronchial carcinoma of malignant type composed of cells elongated in shape with a small deeply staining nucleus and a moderate amount of cytoplasm granular in nature. There was no definite structural arrangement except in certain areas where columnar cells were present in short rows lying in fragments of stroma. A fair amount of new fibrous tissue was evident in dense strands.
(19) C.H., aged 42. Chauffeur.

At the middle of March 1929 the patient was in bed for three weeks with influenza. He was never quite well and at the beginning of June he noticed that he was breathless on exertion. He had some cough and for four weeks his sputum contained blood. Examination failed to reveal any tubercle bacilli. He began to be dyspnoeic even when in bed, and sweated a good deal. He was admitted to hospital on 6.7.29 when he had some inspiratory stridor and considerable dyspnoea. Radiogram showed diffuse infiltration of the right lower lobe. Wassermann Reaction - negative. He went gradually downhill and died on 11.7.29. Provisional Diagnosis - Pulmonary Tuberculosis.

Post-mortem findings. Fairly well nourished. Each pleural cavity contained about a pint of yellow fluid. There was no evidence of pleurisy and there were no adhesions. In the mediastinum posterior to the aorta was a large firm mass extending to the right 2" above the arch of the aorta infiltrating the right lung and to a less extent involving hilum of the left lung. The main mass was situated in the right lower lobe, the borders being sharply defined. The mediastinal glands were enveloped but demarcated. A secondary growth the size of a hazel nut was situated in the tail of the pancreas. Both kidneys showed scattered small tumours in the medulla and cortex, and at the hilum of the/
the left kidney. The left suprarenal was also involved. Microscopical examination showed epithelial cells elongated in shape with large elliptical nuclei staining irregularly with haematoxylin. The cytoplasm varied in amount. Rounded cells with rounded nuclei were evidently columnar cells cut transversely. The metastases had a similar appearance. Pathological Diagnosis - Carcinoma of oat seed type arising from bronchial mucosa.

(20) J.M., aged 58. Blacksmith.

Towards the end of April 1929 the patient began to experience a choking sensation in his throat and breathlessness on exertion. This steadily became worse and he was even dyspnoeic when in bed. At the beginning of June he began to cough up blood. This persisted until admission on 28.6.29. There was marked inspiratory stridor but the vocal cords showed no abnormality which would account for hoarseness. Radiogram showed obscurity at the right apical region and at both bases. The heart shadow appeared to be enlarged. Death occurred on 2.7.29.

Provisional Diagnosis - Aneurysm of Aorta.

Post-mortem findings. Well developed. Well nourished. Pleural cavities almost completely obliterated by old adhesions. A mass of nodules was present about the bifurcation/
bifurcation of the trachea, invading the pericardium and right auricle, and continuous with the tumour involving the lower right lobe which was solid and adherent to the thoracic wall. Section showed that the growth had extended along the bronchi into the lower lobe. There was no ulceration of the mucosa but the tumour was present both within and without the cartilage. The pericardial sac was obliterated by old adhesions. The liver contained numerous small metastases and one nodule was present in the great omentum. Microscopical examination showed the tumour to be of the oat seed type. Cells were irregular in clumps and the perivascular lymphatics and blood vessels showed marked infiltration by narrow columns of single cells. The lining epithelium of the trachea was intact but squamous metaplasia was evident. A tendency towards the formation of acini in places suggested origin from a bronchial mucus gland.

(21) D.T., aged 54. Labourer.

In December 1928 the patient complained of a pain in the left side of his chest and of cough. The pain became easier after a few weeks but the cough persisted and the small amount of sputum was tinged with blood. On 10.2.29 the pain became worse, he became feverish/
feverish and sweated profusely. He was admitted to the medical wards on 18.2.29, the appearance suggesting pneumonia. Purulent fluid was aspirated from the left side and culture gave a growth of staphylococci. He was transferred to the surgical wards and at operation on 25.2.28 exposure by rib resection showed that the left lower lobe was solid. No pus was obtained from the pleural cavity. He went downhill after operation, became dyspnoeic and cyanosed, and died on 28.2.29.

Provisional Diagnosis - Neoplasm of Lung.

Post-mortem report. Rather thin. Left pleural cavity contained two to three pints of turbid fluid and adhesions were extensive over the upper lobe. A small growth was present at the left lower major bronchus causing ulceration of the mucosa and stenosis. The lower lobe showed marked bronchiectasis and an abscess cavity was situated close below the surface. There was no extension to the mediastinum or to the right lung and there were no metastases. Histological section showed a very cellular widely infiltrating growth composed of epithelial cells. There were no cell nests and no acinar formation was seen.
(22) S.C., aged 50. Labourer.

On July 4th 1928 a sharp jabbing pain was felt below the left ribs. This lasted for 5 days but recurred periodically. At the end of July there was breathlessness and cough with blood stained sputum. He lost weight and became weak, and was admitted to the Medical Wards on 14th September 1928. X-ray showed marked obscurity of almost the entire lung field, the base and apex being clear. The cardiac shadow was pushed to the right and the appearance suggested lung neoplasm. On 21.9.28 the chest was explored and culture of the fluid produced a growth of non-haemolytic streptococci. He was transferred for operation for empyema of the left pleura. He made a good recovery and was discharged for convalescence on 25.10.30. The wound healed and he felt well. Cough and pain returned however with fever at night and on 18.1.29 he was readmitted to the Medical Ward. Wassermann Reaction negative. Exploration on 11.1.29 produced pus. On January 16th X-ray showed great opacity of the left lung. He was again transferred for surgical treatment and on 17.1.29 a thick walled cavity was opened but no pus was found. The patient became worse, with cough and blood stained sputum, and died two days later on 30.1.29.

Provisional Diagnosis - Empyema and Pneumonia. ? Tumour.

Post-mortem/
Port-mortem findings. Emaciation. The left pleura was obliterated by old adhesions and several collections of fluid were present. The largest, containing two ounces, was situated in the paravertebral gutter. The left lung was reduced in size and a firm fibrous mass at the hilum encircling the arch of the aorta had caused marked stenosis of the left main bronchus about two inches above its division. The inner surface showed small raised reddish areas of ulceration. The major bronchi were obliterated and bronchiectasis was marked. There were no glandular or other metastases. Section revealed a cellular tumour composed of epithelial cells of the oat seed type varying in size, mostly round with well staining nucleus and moderate amount of cytoplasm. Masses of cells lay between dense strands of fibrous tissue. There were no columnar cells and no acini or cell nests were seen.

(23) J.S., aged 45. Barman (Recently rubber worker). During December 1928 the patient complained of a dull pain in the back of the chest. This became gradually more severe and he became much thinner. He was admitted to hospital on 12.3.29, when it was found that the supraclavicular glands were enlarged and hard. Radiogram showed marked root shadows but no infiltration. Three weeks later there were signs of/
of fluid at both bases and he was found to have paresis of the left side of the palate. The vocal cords were normal. Wassermann negative. He continued to go downhill and died on 7.4.29. Provisional Diagnosis - Mediastinal Tumour.

Post-mortem record. Emaciated. Right pleura contained one and a half pints of clear fluid, and small firm nodules were evident on the serous surface. At the bifurcation of the trachea there was a mass of hard malignant tissue with extensive peribronchial infiltration. There was no sign of a tumour of the bronchial mucosa. The pericardium was infiltrated at the root of the pulmonary artery. A firm mass was situated at the upper end of the lesser curvature of the stomach. The liver contained several secondary nodules and the para-aortic glands were involved. Histological section showed atypical proliferation of epithelium of a mucous gland. The superficial portions contained acini while the deeper areas were composed of large round cells with fairly large nuclei. Pathological Diagnosis - Undifferentiated carcinoma of mucous gland.

(24) W.S.M., aged 52. Compositor (Played a wind instrument). The patient was in good health until the beginning of September 1928 when he gradually developed breathlessness on exertion and had some difficulty/
difficulty in breathing. This became worse and he complained of a dry cough. He found that the dyspnoea varied from time to time. He was admitted to hospital on 25.10.28 and became steadily weaker until death on 28.10.28.

Post-mortem findings. Well nourished. The left pleural cavity contained a few ounces of fluid. There were no pleural adhesions. The upper mediastinum contained a firm mass of enlarged lymph glands which constricted the trachea antero-posteriorly. In continuity with this mass were confluent flat nodules in the trachea and bronchi and the tumour appeared to have arisen from the anterior surface of the right bronchus half an inch from its commencement. Extension had occurred for \(1 - \frac{1}{2}\)" into the lung markedly constricting the major bronchi. Most of the right lung was airless and collapsed. There were scattered nodules in the liver. The histological appearance was that of an "oat seed" tumour the more superficial layers demonstrating the transition from ordinary bronchial epithelium to cells of the "oat seed" type. In some parts the bronchial epithelium showed slight degree of squamous metaplasia. The liver nodules were similar in structure.
(25) W.B.G., aged 60. Iron Moulder.

In June 1927 the patient developed influenza and was in bed for ten weeks complaining of pain in his chest, dyspnoea, and cough. Again in August he spent four weeks in bed and had a recurrence of the pain. Since then he has suffered from breathlessness, cough, with blood-stained sputum losing a considerable amount of blood. There was no fever and no loss of weight, the chief complaint being of weakness. He was admitted to hospital on 19.11.28. Bronchoscopy showed a constriction of the left lower bronchus. Bronchogram showed complete stenosis of the lower left bronchus. At operation on 24.11.28, under nitrous oxide, oxygen, and ether, the left lower lobe containing a tumour was exposed as a first stage of treatment. The condition remained satisfactory for two weeks when pneumonia of the right side developed suddenly and the patient died on 11.12.28. Provisional Diagnosis. Carcinoma of Left Lung.

Post-mortem findings. Fairly well nourished. The left pleural cavity presented chronic adhesions which were extremely firm over the lower lobe. In relation to the bronchi near the root was a small circumscribed mass, white in colour, and 3" in diameter. The corresponding lung tissue showed gangrenous and foul smelling bronchiectatic cavities. The remainder of the left lung was consolidated. Pneumonia was also evident in the right lung.
lung. The bronchial glands contained pin point white areas. There were no other secondary growths.

Microscopical examination of the tumour showed cells varying in shape from flattened polyhedral to columnar. There was a considerable amount of fibrosis of a vascular nature. There was no microscopic evidence of involvement of either bronchial or other lymph glands.

Pathological Diagnosis - Carcinoma from mucosa of left lower bronchus.

(26) E.M., aged 74, Jewel case Maker.

Shortness of breath for some years recently became more marked. For several years he has had a chronic cough with thick sputum. He has lately become weaker, has lost weight, and for some weeks there has been a pain in the left shoulder and chest. When seen by his doctor a pleural effusion was found on the left side and 80 ounces of fluid were aspirated. After admission to hospital on 31.8.28, 20 ounces of blood-stained fluid were removed. The percussion note over the whole left side was dull. On 3.9.28 a radiogram showed almost complete obscurity of the left lung field, the heart being displaced to the left. The appearance was suggestive of lung tumour. Wassermann Reaction, strong positive. He became weak and breathless. Death occurred on 15.9.28. Provisional Diagnosis - Malignant Tumour/
Tumour of lung.

Post-mortem findings. Emaciated. The right pleura presented some adhesions, dense at the apex. There were no abnormal signs in the right lung. The left pleura contained a considerable amount of fluid and dense adhesions. The left lung was collapsed and showed numerous circumscribed greyish nodules some in the lung substance others connected with the pleura. The root glands showed congestion. There were no metastases. Histological section showed extensive infiltration of the lung by malignant cells irregularly arranged and suggesting an epithelial origin. The aorta gave evidence of specific aortitis. Pathological Diagnosis - Carcinoma arising from cells lining the bronchi.

(27) A.H., aged 56. Tailor and Cutter.

In 1925 the patient had a definite haemoptysis. He remained in good health until January 1928 when he caught a chill. He was in bed for a month with a cough and his sputum was at times streaked with blood. At the end of January he was well except for a pain at the back of his neck which was at times severe. His chest gave no further trouble but the neck became more painful, the pain radiating from ear to ear. This constituted his main complaint. At the beginning of March/
March he developed pleurisy and was admitted to hospital on 14.3.28. A boggy slightly tender diffuse swelling was found to be present at the nape of the neck. X-ray evidence was of marked rarefaction of the spine of the second cervical vertebra with bony debris in the soft tissues. The appearance suggested an infective lesion of bone. Wassermann Reaction - negative.

On 21.3.28 the left pleural cavity was explored and a little serous fluid was aspirated. On 16.4.28 there was paresis of the left leg and analgesia of the left side. The left knee jerk was absent and the right was exaggerated. The left side gave a flexor response of the plantar reflex. Two days later he developed incontinence of urine and faeces and died on 21.4.28.

Provisional Diagnosis - Carcinoma of Lung.

Post-mortem Report. Emaciated. The left pleura contained a small amount of fluid. Both lobes of the left lung were collapsed. The upper lobe showed a growth 2" x 3" arising near the hilum, infiltrating the upper lobe with numerous nodules following the line of the lymphatics, and situated near the pleura. The mass was solid, white in colour, with small areas of haemorrhage, and surrounded a calcified bronchial gland. The lower lobe showed pneumonia. The right lung was not involved by growth. The hypopharynx contained numerous small sub-epithelial white nodules. The bronchial glands were enlarged and showed malignant involvement/
involvement. There were scattered nodules in the liver and three small nodules occupied the head, body, and tail of the pancreas. The vertebrae in the cervical region were involved by tumour growth which compressed but did not infiltrate the cord. Metastases were also found in the sternum, fifth rib, both iliac bones, and throughout the vertebrae from the cervical to the lumbar region. There was no intracranial metastasis. Marrow from the femur contained white metastatic nodules. Microscopical examination of the tumour showed irregular masses of epithelial cells columnar in shape and occurring in groups in some areas. In the liver the appearance was similar and in certain parts of the section the cells appeared to be ciliated. The bronchial glands were replaced by groups of columnar cells some of which seemed to present cilia. Pathological Diagnosis - Extensive blood spread from a primary tumour of the mucosa of the left bronchus.

(28) W.W., aged 62. Labourer.

For seven years there has been a history of gnawing epigastric pain which occurred after food. There were long periods of freedom but sixteen months ago the pain recurred and since the end of 1927 it has been constant and severe and accompanied by loss of appetite/
appetite and weight. In January 1928 a dry cough developed. He was admitted to hospital on 22.2.28. There was marked evidence of dilated superficial veins over the lower part of the thorax. A hard nodule the size of a walnut was situated in the subcutaneous tissue to the left of the umbilicus. The urine contained albumen. The faeces gave a negative benzidine reaction. Radiograms after a barium meal showed a pre-pyloric filling defect in the stomach. Wassermann negative. X-ray of the thorax gave evidence of a new growth in the posterior mediastinum. The subcutaneous nodule was excised and the histological appearances were suggestive of metastasis from an adenocarcinoma. The patient went downhill and died on 28.3.28.

Provisional Diagnosis - Mediastinal new growth.

Post-mortem findings. Emaciated old man. Right pleural cavity contained recent adhesions. At the root of the right lung a firm white fibrous looking growth invaded the lung and obstructed some of the bronchi. The bronchioles of the right lung especially of the lower lobe contained muco-pus. The tumour mass was about the size of an orange, partially surrounded the aorta, trachea and oesophagus, and was sharply demarcated except at the points of invasion of the lung. Section showed areas of necrosis. Gastric and duodenal ulcers were present and there was evidence of recent acute peritonitis with fat necrosis. A large tumour/
tumour mass at the root of the mesentery invaded the pancreas. Two nodules were situated in the cortex of the right kidney. The left suprarenal contained small nodules and was surrounded by fat necrosis.

Microscopic report - Typical lymphosarcoma

(29) D.S., aged 37. Engineer.

In June 1927 the patient "took a chill", complained of pain in his chest, and coughed up some blood. He was admitted to a Sanatorium with slight cough, pain, and night sweats. He was thought to be tuberculous but tubercle bacilli were never found in his sputum. He was admitted to hospital on 1.3.28.

There were signs of consolidation of the left lung resembling tuberculosis with cavitation and some pleural effusion. He had become thinner. A radiogram showed complete obscurity of the left side of the chest with no displacement of the mediastinum, the appearances suggesting the presence of a tumour. He brought up copious foul sputum but there was no blood. Two applications of deep X-ray therapy were given but he became weaker and died on 21.5.28. Provisional Diagnosis - Cancer of left lung.

adhesions. Left lung - root entirely replaced by a growth involving the left bronchus and causing almost complete stenosis and marked bronchiectasis. There was no normal lung tissue, the remainder being divided into small cavities which contained pale solid material and much pus. The right pleura contained some free fluid and showed commencing invasion by extension to the root where the bronchus was partially obliterated. The liver contained large pale nodules, the caudate lobe being almost replaced by malignant tissue. The pancreas showed two nodules, and both suprarenals were almost completely replaced by new growth. Small nodules were present in the cortex and medulla of both kidneys. The bone marrow was not involved and the para-aortic glands showed no invasion. Histological examination of the primary growth showed cells of the oat seed type which are said to arise from the epithelium of the bronchi, and extensive tuberculous infection of the lungs and also of the liver.

(30) A.F., aged 59. Polisher.

The patient was treated in hospital in 1925 for contusion of the shoulder obtained in an accident. Thereafter he was never completely well, has lost weight, and during the last three months he has complained of dry cough, palpitation, breathlessness, and exhaustion. He/
He was admitted to hospital on 30.6.27 and went slowly downhill, cough and weakness becoming marked. X-rays showed an appearance suggestive of aneurysm. Death occurred on 7.9.27.

Provisional Diagnosis - Aneurysm of Aorta. Bronchitis.

Post-mortem findings. Emaciated. Left pleura contained a pint of turbid fluid. The hila of the lungs and the root of the heart were extensively invaded by a large mediastinal tumour involving the arch of the aorta and infiltrating the pericardium. The tumour was soft, white and fleshy, and contained a bluish fluctuating protuberance suggestive of a blood filled dilatation. A chronic gastric ulcer was found and a lymph gland at the upper pole of the left kidney showed extensive malignant involvement. Microscopical examination of the tumour presented spindle-shaped cells with scanty cytoplasm situated in a scanty stroma which contained many fairly large thin walled vessels, around which the cells tended to be arranged radially giving a peritheliomatous appearance. The tumour is of the oat seed type.

(31)/
Mrs M.B., aged 60. Housewife.

At the beginning of March 1927 the patient caught a chill. Four or five days later she developed pain in the right side of the chest and a cough with copious sputum. She had previously been in good health and had had no chest troubles. On admission to hospital on 20.3.27 she was found to have pleurisy on the right side and there was copious haemorrhagic sputum. On 23.3.27 a radiogram showed marked infiltration of the right lower lobe, several transradiant areas suggestive of cavitation. There were no tubercle bacilli in the sputum. Wassermann Reaction - negative. Bronchoscopic examination on 11.4.27 revealed bronchiectasis of the right lower lobe. Aspiration of the chest on 20.4.27 produced purulent fluid. Death occurred 10 days later on 30.4.27.

Post-mortem findings. Poorly nourished. Left pleural cavity was filled with semi-purulent fluid both lobes being collapsed, the lower lobe gangrenous with a large quantity of pus. The right pleurae were adherent and the lower lobe of the right lung contained a bronchiectatic cavity 1" in diameter with smooth walls. Microscopic section from the cavity showed a squamous epithelioma arising from the bronchial mucosa. The bronchial gland examined showed widespread infiltration by carcinoma.
J.C., aged 39. Pig-feeder.

The patient is said to have had vague pains in the abdomen seven months before admission. In spite of disappearance of the pains he has never been thoroughly well since. At the beginning of December 1926 he complained of a choking feeling in the throat and noticed his face to be swollen. The swelling has increased and has extended to the right hand. The left hand has become slightly oedematous. He was admitted to hospital on 12.1.27. A radiogram on 14.1.27 indicated a neoplasm at the right hilum, diminished air entry of the lung, suggestive of carcinoma of the upper right bronchus. There was no evidence of vagal or phrenic involvement. Wassermann - negative. Later there were signs of fluid at both bases. Death occurred on 17.2.27. Provisional Diagnosis - Bronchial Carcinoma.

Post-mortem Report. Well developed and well nourished. Right pleura contained a large amount of clear fluid. A large greyish white mass involving the mediastinum was adherent to the first and second ribs and cartilage anteriorly and to the third and fourth right ribs posteriorly. There were fibrous adhesions below the right middle and lower lobes. The left pleura showed fibrous adhesions between the lower lobe and the diaphragm. The pleural surface of both lungs was studded with yellow dots 1 - 1.5 mm. in diameter. The mediastinum was occupied by a hard nodular mass.
4\(\frac{1}{2}\)" x 6", white in colour, with greyish mottling and central necrosis. The aortic arch was encircled and compressed to a diameter of \(\frac{1}{2}\)" and the right common carotid and pulmonary vessels were compressed. The upper lobe and a ridge of the middle right lobe were infiltrated, the line of demarcation being sharp. The left lung showed puckering at the apex and congestion. Glands at the hilum were adherent to the malignant mass. Both surfaces of the pericardium were studded with small nodules. The liver contained numerous secondary growths. The mesenteric glands were hard and enlarged. The spleen showed no naked-eye evidence of involvement. Microscopic examination of the tumour showed it to be of the oat seed type composed of large nuclei and little cytoplasm. The liver was infiltrated by sarcomatous-like cells. The so-called oat seed sarcoma is regarded as a medullary carcinoma of the bronchi.

(33) Mrs C. McI., aged 48. Housewife.

About June 1926 the patient began to complain of breathlessness and cough with frothy white sputum. These persisted and increased in severity. There was no loss of weight but she became very weak and dyspnoeic. On admission to hospital on 11.12.26 there was dyspnoea, cyanosis, and some general oedema. She became progressively/
progressively and rapidly feeble. Cyanosis and oedema increased and there was a frank haemoptysis before death on 14.12.26.

Provisional Diagnosis - Bronchitis, Heart Failure.

Post-mortem findings. Well developed and obese. No free fluid. The visceral pleura of each lung showed wide permeation of the lymphatics by tumour growth producing a nodular surface of the lung. The right lung was infiltrated throughout its extent. The left lung contained a mass of white solid tumour tissue in the upper lobe above the hilum, the remainder of the lung being infiltrated. The mediastinum evidenced a fairly large tumour above the bronchi and smaller masses including the glands. There was no trace of metastatic growth elsewhere in the body. Microscopical examination showed a typical bronchial carcinoma of the columnar-celled type.

(34) G.A., aged 47. Labourer.

In June 1925 the patient began to suffer from a cough with expectoration of sputum. There was no pain. The sputum often contained blood but never in great quantities. He became short of breath and easily tired. Apart from being "gassed" during the war he had always been healthy. On admission to hospital on 25.3.26 he had lost two stones in weight. The right/
right side gave a stoney dull percussion note. There was no evidence of pleural effusion on repeated exploration. He went steadily downhill and died on 18.4.26.

Provisional Diagnosis - Mediastinal Tumour.

Post-mortem Report. Well developed. No emaciation. The right pleura was obliterated by firm dense adhesions. A large tumour occupied the whole central portion of the lung from the root outwards and was adherent to the diaphragm. The left pleura contained two pints of clear fluid. There was no malignant involvement of the left lung but extension had occurred from the growth to the pericardium and into the right auricle. There were no enlarged glands in the mediastinum or elsewhere and no secondary growths. The microscopical examination showed "lymphosarcoma of the mediastinum" of the oat seed type. The characters showed little justification for the term "lymphosarcoma" and the tumour is more correctly classified as "oat celled" bronchial carcinoma.

(35) W.M., aged 63. Poulterer.

About June 1925 the patient developed neuralgic pain in the left side of the chest, radiating down the left arm. This was severe at times and increased in frequency and intensity. There were no other notable symptoms. He was admitted to hospital on 3.12.25. The/
The blood Wassermann reaction was positive. Cerebrospinal fluid was found to give a negative Wassermann reaction. On 7.1.26 he developed loss of sensation below the costal margin and flaccid paralysis of the legs with incontinence of urine. On 9.1.26 retention of urine supervened and the abdomen became distended. Death occurred nine days later on 18.1.26.

Provisional Diagnosis - Gumma of Cord.

Post-mortem Report. Well developed. Well nourished. The left pleura contained some free fluid and the lung was collapsed. The apex and upper lobe were occupied by a mass of pinkish growth adherent to and eroding the second thoracic vertebra. The large fungating growth formed a cavity in the upper lobe in which there were papilliform projections. The mediastinal lymph glands were discrete and well defined from the growth. The right lung showed bronchitis and chronic pleural adhesions but no malignant involvement. The second thoracic vertebra was eroded by growth which compressed the third dorsal segment of the cord extra-durally but showed no invasion. There were no other metastases.

Histological examination of the tumour gave evidence of a rapidly growing adenocarcinoma, the majority of the cells being more or less undifferentiated. There were areas of necrosis. The lymph glands showed no involvement. Pathological Diagnosis - Adenocarcinoma arising from bronchial mucous membrane.
ANALYSIS.

Incidence. During this period of five years thirty-five cases of primary intrathoracic tumours were submitted to post-mortem examination. One case of Hodgkin's Disease of the mediastinal glands and at least two instances where the tumour was found to be secondary to a growth in some other organ have not been included in this series. From the general statistical standpoint, it is of striking interest that of the thirty-five cases thirty-three were found to be pulmonary carcinomata and only two were diagnosed as lymphosarcoma. Unfortunately microscopical section of one of the two latter growths was not available for verification of the diagnosis, but the appearance was said to be characteristic. The other example of lymphosarcoma has been reproduced in this work. During the period concerned about 3,000 cases were submitted to autopsy, from which it may be concluded that more than 1% of these cases were found to be primary intrathoracic cancer. This figure is in agreement with that obtained from the collection of the series reported by different observers and noted in Table I. In the ensuing analysis the thirty-three examples of carcinoma will be considered together and the two cases of lymphosarcoma will be dealt with separately under each heading.

Age/
Age and Sex. Of the total 35 cases the average age was $52\frac{10}{12}$ years. The 33 cases of primary lung cancer showed an age incidence averaging $53\frac{3}{12}$ years, which is slightly higher than the figure 51 years obtained in Table IV, though sufficiently close to require no comment. The series showed the following incidence in decades: 0-10 years, 0; 11-20 years, 2; 21-30 years, 0; 31-40 years, 5; 41-50 years, 11; 51-60 years, 11; 61 years and more, 6. The ages of the two cases diagnosed as lymphosarcoma were 31 and 62 years. Excluding these, 25 (75%) of the 33 cases of pulmonary cancer occurred between the ages of 51 and 60 years. These findings are in accordance with the results given in Table IV. The youngest patient was aged 18 years, and the oldest was 74 years of age. The average age of the more differentiated types, squamous and cylindrical cell carcinomata, was 55 years, while the average age in the oat cell forms was $44\frac{8}{12}$ years. This finding confirms Barnard's belief to which attention has already been drawn.

Both cases of lymphosarcoma were found in males. Pulmonary carcinoma occurred in 27 (81.8%) males and in 6 (18.2%) females. The corresponding figures in the general review were 77.87% males and 22.13% females.

Occupation. There is no evident selective occupational factor in this series. Lymphosarcoma occurred in a miner.
miner and in a labourer. Carcinoma affected five labourers, three miners, a shipwright, a blacksmith, an iron moulder, a quarry foreman, a copper smith, a chauffeur, and others of divers occupations. There is no preponderance of those associated with horses or of individuals working in any special environment. The majority of the cases concerned indoor workers and the occupations are typical of those of the patients treated at this hospital.

Predisposing Factors. Trauma may have played some part in the onset of malignant disease in case (30), where contusions of the right shoulder and trunk were noted as the initial feature of the illness though respiratory symptoms did not appear for at least six months after the accident. There is no definite proof of the association of trauma with cancer in this case and the two conditions were probably coincidental.

Active tuberculosis was found in case (29) only of this series although apical scarring and calcified glands were noted in several instances. There is no evidence of pulmonary syphilis in any of these cases. The blood Wassermann reaction was positive in four (cases (1), (8), (26), and (35)) and negative in fifteen other examples.

In two cases there was a history of chronic bronchitis. In case (26) there had been a chronic cough/
cough with expectoration of sputum for many years (the Wassermann reaction was positive), and in case (17) there was a history of recurrent attacks of bronchitis since the age of seven. In only two examples the examination of the lungs at autopsy showed old-standing bronchiectasis; in case (31) carcinoma had developed in the wall of a bronchiectatic cavity, and in case (7) there was evidence of old bronchiectasis with multiple cavities in both lungs but the growth was pedunculated and localised to one main bronchus. Silicosis was a marked feature of case (12) but was not found in any other instance. Squamous metaplasia of the bronchial epithelium was noted in three cases, (7), (24), and (31), and of the tracheal epithelium in case (20); in two of the former the tumour was of the oat celled type. There was a history of "having been gassed" during the Great War in case (34).

In this series there does not appear to be any evidence of special factors of predisposition by occupation or by disease.

PATHOLOGY.

Site of origin. Of the 33 examples of pulmonary carcinoma, 16 appeared to arise from the right side, and 16 from the left side. In one instance, case (30), the/
the growth occupied the mediastinum and it was not possible to attribute its origin to one or other side. These findings concur with those of Table VI. Accurate localisation may be extremely difficult to ascertain, especially in the more advanced cases, but in twenty-one instances the origin appeared to be as follows:

Right main bronchus - 8, right upper bronchus - 2, right lower bronchus - 4, left main bronchus - 10, left upper bronchus - 3, and left lower bronchus - 2.

It is obvious that these figures are not strictly accurate on grounds which have already been discussed in the major part of this work. Though definite deduction from a small series cannot be of great value the results are comparable to those of Table VII, which showed that there was no marked predilection, but that of the individual lobes affected the right upper lobe showed a slightly lower frequency and the right lower lobe a rather greater incidence of carcinoma. Both cases of lymphosarcoma involved the right main bronchus and surrounding lung tissue.

Gross Pathological Features. The classification adopted by Miller and Jones and already quoted is the most serviceable and will be employed in dealing with the present series.

1. Intrabronchial growths tending to blockage of the lumen. Two examples conform to this group. Case (7) presented a pedunculated squamous carcinoma growing from/
from the right main bronchus causing obstruction of the lower branch and partial obstruction of the upper branch. There was no marked local extension and the mediastinal glands were not affected. Case (15) was examined by bronchography which showed a filling defect of the right bronchi. Two years later however the tumour had developed to form a hilar mass.

2. Peribronchial tumours affecting the lining epithelium producing a growth radiating from the root. This group contains 16 of the series of 33 cases. In most instances there was a fairly large mediastinal mass and varying degrees of spread to the periphery were seen. In case (8) extension had occurred by way of the lymphatics from the growth at the hilum to a mass in the lower lobe. In cases (11) and (12) the tumour had spread to the other lung which contained secondary nodules. In nearly all examples the mediastinal glands were involved. The mediastinal portion of case (16) had extended to the thoracic vertebrae and in case (32) the ribs were infiltrated. In eight instances the tumour had caused partial or complete obliteration of the lumen of the bronchi either by pressure from without or by occlusion from within and ulceration of the mucosa.
3. Solitary nodules at the periphery or at the hilum. Nine cases may be placed in this group. In cases (21), (22), and (25) there were small growths at the hilum causing stenosis of the bronchi and bronchiectasis without involvement of the mediastinal glands or distant metastases. In case (2) the tumour was localised at the hilum and bronchiectasis was present. It was doubtful whether spread had occurred to the glands. In case (17) the right hilar glands were involved, and in case (19) there were distant metastases. The lung had collapsed in case (24) where extension was localised to the main bronchus. Case (29) showed a nodule at the hilum causing stenosis, and distant secondary growths. In case (31) a small malignant nodule was present in the wall of a bronchiectatic cavity but spread had occurred to the mediastinal glands.

4. Scirrhous type in the parenchyma with infiltration of a lobe. There is no example of this form in the series. The difficulty of differentiation between a tumour "in the parenchyma" and one arising from a minor bronchus has already been indicated.

5. Mediastinal Growth. Case (30) is the sole example of a tumour occurring in the mediastinum involving both hila without obvious origin from one or other side. The histological appearances were those of the/
the "oat seed" type and the condition had been
diagnosed as aneurysm of the aorta.

6. Massive consolidation of a lobe. To this group
four cases may be allotted. In case (3) the right
upper and middle lobes were replaced by malignant
tissue. The lower lobe in case (20) was extensively
infiltrated, consolidated, and adherent to the
chest wall. There was a mass at the hilum and it
was difficult to decide whether the growth in the
lower lobe was a secondary process. Case (33)
presented massive infiltration of the whole right
lung and a solid mass in the left upper lobe with
infiltration of the remainder of the left side.
The visceral pleurae of both sides were extensively
affected by lymphatic permeation although there
were no extrathoracic metastases in this example.
Similarly case (34) showed a massive growth of
the right lung without glandular or other meta-
stases.

7. Massive consolidation with abscess formation. One
instance of this variety may be recorded. In case
(35) there was a fungating growth in the upper lobe
with a cavity into which there were papilliform
projections. Although direct extension to the
adjacent vertebrae had occurred, the glands did
not appear to be involved and there were no distant
metastases.
8. Bronchial Obstruction due to growth. This section is not considered as an entity though many of the types recorded above may be included. Bronchial obstruction was evident in sixteen cases of which twelve showed resulting bronchiectasis, and one presented an abscess. In case (7) bilateral bronchiectasis was of long standing but on the affected side there appeared to be obstruction due to growth. Of five examples of collapse of the lung, cases (2), (24) and (26) were not associated with suppuration though a well marked effusion was present in case (26). In case (2) atelectasis was almost complete. In one of the specimens of lymphosarcoma, case (28), there was bronchial obstruction without suppuration.

9. Patchy infiltration with discrete nodules. This rare form is exemplified only by case (26) where the left lung contained several discrete greyish nodules in the centre and at the periphery. The lung had collapsed and an effusion was present. It is probable that this type of growth was actually a manifestation of extension from a primary tumour of one of the bronchi.

10. There was no example of miliary carcinomatosis in this series.
Local Behaviour.

It has already been mentioned that in the various types represented by thirty-three examples of carcinoma of the lung, bronchial obstruction occurred in sixteen cases, bronchiectasis in twelve, empyema in two, and abscess in one case. Collapse of the greater part or of the whole lung was present in five instances. Pleural effusion was evident clinically in twelve cases, of which the fluid was haemorrhagic in four and purulent in two. Effusion occurred as a terminal feature in the majority of the series. These findings concur with those of the main review.

Bronchial occlusion occurred in 78 of Simpson's 139 cases and bronchiectasis was present in about a third of 184 cases recorded by Maxwell. Lung abscess was more common in the series quoted for which the figures of incidence were sixteen and thirty-eight respectively.

With regard to the extension of growths, three cases presented metastatic tumours in the other lung, one of which showed nodules in the pleura. Two examples, cases (16) and (32), evidenced spread to the opposite visceral pleura without involvement of the lung. In many cases large masses in the mediastinum had extended to the hilum of the contralateral lung, occasionally with compression of the bronchi, but without further spread. The mediastinal glands were definitely involved/
involved by malignant growth in nineteen cases, while in seven instances of this series the glands did not appear to be affected. This was confirmed by histological examination in several, and in two further examples, cases (2) and (19), it was probable that spread had not reached the glands.

Nine cases showed involvement of the pericardium, and in five of these malignant tissue had extended into the heart, case (5) into both auricles, cases (13), (20), and (24) into the right auricle, and case (14) into the left auricle. In two instances, cases (3) and (32), spread to the pericardium appeared to have been along the lymphatics, the serous surface being studded with small nodules. In the remainder the membrane had been involved by direct extension. Of these nine examples, eight were of the oat cell type.

In three cases the great vessels were compressed; the pulmonary vessels in cases (15) and (18), and the aorta, right common carotid artery, and pulmonary vessels in case (32). In no instance was erosion of vessels observed. Apart from case 21 where paralysis of the diaphragm was presumed to result from involvement of the phrenic nerve, the nerves do not appear to have been affected in any of this series. Where stridor or hoarseness was noted laryngoscopy showed no abnormality of the vocal cords. The oesophagus was slightly compressed in one instance, case (28), and in case (9) had/
had produced a groove in the tumour. There was no ulceration of the oesophagus. Direct extension to the chest wall was noted in case (32), where the ribs were infiltrated anteriorly and posteriorly without spread to the subcutaneous tissues, and in cases (3) and (35) the growth had directly involved the thoracic vertebrae.

With regard to the two examples of lymphosarcoma, both affected the right side of the mediastinum more than the left; the right bronchus was compressed in one and the pericardium was involved in the other.

Maxwell found the superior vena cava to be infiltrated in 25 of 184 cases and recurrent laryngeal nerve involvement in 14 instances. Simpson noted thrombosis of the larger veins in 24 of 139 cases. With these exceptions the present findings are comparable to those of other series.

General Behaviour.

The appearances of the patients at autopsy are described as well nourished in twelve cases, slightly emaciated, poorly nourished, or thin in ten, and emaciated in thirteen instances. The general condition at death is thus in striking contrast to that associated with cancer of some other organs.
Of the thirty-three cases of carcinoma, fifteen showed no evidence of extrathoracic metastasis (two squamous, eight columnar etc., and five oat cell tumours), and of the latter seven growths (one squamous, three columnar, and three oat cell types) did not appear to have spread even to the mediastinal glands. Of the remaining eighteen cases with distant metastases the liver was affected in eight, extrathoracic glands in seven, the pancreas in seven, the suprarenal glands in six, the skeletal system in five, the kidneys in four, and the peritoneum in two cases. In four instances secondary growths were widespread and involved many organs. In the remainder the metastases were scattered. Of the lymphatic system, the cervical glands were affected in four, the mesenteric glands in one case, glands at the lesser curvature of the stomach in one instance, and in the remaining example a lymph gland at the upper pole of the left kidney showed malignant involvement. The left suprarenal was the site of metastasis in three cases and the right in two. In a sixth instance both glands were affected. The pancreas was involved at various areas in seven cases, in some of which the gland was extensively replaced by malignant tissue, and in two there were isolated nodules in the head, body, and tail. Both kidneys were involved in three cases and the left kidney was affected in a fourth. The right lobe of the thyroid was replaced/
replaced by malignant growth in one instance. The bones which were affected included the vertebrae in four cases, in two of which direct extension may have been wholly responsible, the innominate bone in two examples, the fibula in one, the sternum and a rib in case (27), and the ribs in case (3). Other sites of metastases were the subcutaneous tissue, bone marrow, and the iliacus muscle.

When the vertebrae had been involved by direct extension or by malignant embolism, the cord was markedly compressed but had not been eroded. There was no evidence of cranial metastasis and, where nervous symptoms had been present, the skull was examined in four cases without any positive finding.

Both cases of lymphosarcoma showed metastases in the intra-abdominal glands, the pancreas, and the kidney; and in one the left suprarenal was involved. The peritoneum in this case evidenced fat necrosis which was especially marked near the left kidney.

On comparative grounds the striking facts concerning this series are the greater frequency with which the pancreas is involved, 21% (8.3% Table VIII), and the apparent absence of cranial metastases. Many cases presenting massive growths with marked local extension and even involving both lungs showed no secondary tumours without the thorax. The oat cell type appears to have a greater tendency to both local and distant extension.
PLATE I.
CASE 9.
OAT CELL TUMOUR.

Low Power. X 120.

The section is somewhat overstained.

A. Deposits of carbon pigment difficult to differentiate from the hyperchromatic cells which are seen invading the surrounding lung tissue at B.

C. Persisting remains of an alveolus.

High Power. X 500.

(a) - Carbon pigment masses.
Hyperchromatic cells lying in a stroma composed of the remnants of alveolar walls - (b)
The cells vary in size and shape. Some are round and others polygonal, and most are of small size. Many are typical oat cells (c). The nuclei are hyperchromatic and the cytoplasm is scanty.
PLATE II.
CASE 2.
SQUAMOID CARCINOMA.

Low Power. X 120.
A. Area of carbon pigment.
B. Portion of cartilage from a bronchus.
C. Malignant cells are interspersed with much fibrous tissue which is most marked and condensed near the area of pigment at D and suggests the appearance of silicosis.

High Power. X 500.
The section is composed of fairly large cells of obvious epithelial character with considerable granular cytoplasm and round or ovoid nucleus. The nucleolus is central and the chromatin network is well marked. The chromatin ring at the periphery of the nucleus is well shown. Mitosis is suggested at (a)
The section shows a very cellular growth, strands of fibrous tissue A and remains of the alveolar walls B.

PLATE III.

CASE 4.

LYMPHOSARCOMA.

Low Power. X 120.

The section shows a very cellular growth, strands of fibrous tissue A and remains of the alveolar walls B.

PLATE III.

High Power. X 500.

Small round cells, all very similar in size, shape, and structure are seen in a stroma composed of fibrous tissue in loose formation. The cells have little or no evident cytoplasm and a nucleus showing a rich chromatin network. These characters and the close similarity of the cells suggest the diagnosis.

LYMPHOSARCOMA.

PLATE III.
HISTOLOGY.

Histological grouping of these cases has been attempted on the lines indicated in the major part of this study.

Squamous carcinoma was found in two instances. In case (7) the growth was pedunculated and intrabronchial. In case (31) the tumour had arisen in the wall of a bronchiectatic cavity. Cell nests were not observed.

Tumours composed of moderately differentiated cells, squamoid, polygonal or columnar shaped, or having the appearance of adenocarcinoma comprise eleven (34%) of this series. Of these, nine showed typical columnar cells and one contained many polyhedral cells, while squamous cells were found in one section and another presented typical oat cells in certain areas.

Nineteen (59%) growths conform to the oat cell type. Of this group, twelve showed also acini, columnar cells, and varying degrees of transition and differentiation. Case (30) presented a peritheliomatous arrangement.

The appearances of the metastases resembled for the most part those of the primary growths. In case (27) where the primary tumour was composed of columnar cells the secondary nodules contained cells which had the appearance of being ciliated. The metastasis in the/
the thyroid in case (16), an oat cell tumour, showed groups of cells in alveolar formation.

The microscopical findings in case (4) are typical of lymphosarcoma and are reproduced in the microphotographs. It has already been shown that the oat cell growths appeared to spread more extensively within the chest. Of nine cases in which the pericardium was infiltrated, eight were of the oat cell group. Similarly the tendency exists with regard to distant metastasis. In this series there were twenty-six metastatic growths in the liver, suprarenal, kidney, and pancreas, of which twenty-one were secondary to primary carcinomata of the oat cell type.

In general the histological appearances of these cases do not differ to any marked extent from those described by other workers. The conclusions will be recapitulated in the summary. The characteristic points of some of the types are well shown in the microphotographs of cases (2), (4), and (9). The proportion of growths composed of cells of poor differentiation is slightly higher (59%) than that indicated in Table IX (54%). In more than half of the oat cell tumours in this series, however, there was evidence of transition stages and more completely differentiated cells were present.

CLINICAL/
CLINICAL FEATURES.

Owing to the similarity of symptoms and signs the two cases of lymphosarcoma are included with the examples of carcinoma for purposes of discussion of their clinical features.

ONSET.

Of the total thirty-five cases, thirteen began their course by "a cold", "a chill", or "influenza", sixteen had a gradual onset of symptoms referable to the respiratory system, and in six cases the illness began gradually and did not at any time present symptoms of pulmonary disease except in one instance in which "chill" was the initial feature. Several patients had been under treatment for a considerable period, cases (3) and (29) in a Sanatorium, and case (11) for five weeks in another hospital six months before death, before admission to the Royal Infirmary. One patient, case (13), had been in hospital seven weeks previously and had been transferred to a Sanatorium for a period before returning to die in the Wards, while another, case (22), had had operation for empyema four months prior to his second operation which terminated fatally.

In the group of sixteen cases where the onset of respiratory symptoms was gradual, cough was the first manifestation in ten, pain in three instances, dyspnoea...
in two and asthma in one case. In the six examples without respiratory symptoms the main features were weakness in case (10), oedema of the face, case (32), and referable to the nervous system in four others. Of the latter, in case (27), after chill and haemoptysis at the onset, pain was the only symptom; lumbago was the initial and persistent feature in case (16), pain in the back in case (23), and pain in the left side and arm marked the onset in case (35) and gradually increased in severity.

Of the individual clinical features, cough was present in twenty-seven instances. In the majority cough was at first slight and dry and later became more severe and associated with sputum. In a few cases cough was paroxysmal. Dyspnoea occurred in eighteen patients in three of whom breathlessness was an initial or early feature. Asthmatic attacks with extreme dyspnoea were noted in cases (3) and (9). Pain was present in twenty-one cases, was referred most often to the chest as a dull aching sensation made worse by coughing, less often the nature was sharp and cutting when associated with pleurisy, and occasionally pain radiated down the arm. In four cases pain was the initial symptom and in four cases, (3), (16) (27), and (35) pain was due to erosion of vertebrae and pressure on the spinal cord and nerve roots.

Sputum was noted in twenty-two cases and was usually/
usually produced after cough had been present for a varying period. In most of the examples with which bronchiectasis was associated the sputum was purulent and copious. Haemoptysis occurred in thirteen instances and developed shortly before death in another case. Frank haemorrhage was found in only six of these cases and occurred subsequent to admission to hospital in case (33). In case (27) three years prior to the onset of symptoms the patient had expectorated a considerable amount of blood.

Weakness was a marked feature in cases (3), (10), and (14), constituted the chief complaint in case (25), and was noted in eighteen of this series. Loss of weight occurred in fourteen instances but, even at death, a third of the patients were in a well nourished condition. Fever and night sweats were marked in nine cases.

Nervous symptoms were noted in five cases. In case (3) sudden pain in the back was associated with paraplegia. Similarly compression of the cord was evidenced in case (16) by periodic attacks of knife like pain in the back, cramps in the legs, sensation of "pins and needles" in the feet followed by paresis and incontinence. In case (23) pain was the major complaint, but here there was no involvement of the spinal cord or nerves. Erosion of the cervical vertebra in case (27) produced pain along the course of the second/
second cervical nerve. Neuralgic pain in the left side and arm was the only symptom in case (35) until the subsequent development of paraplegia and incontinence. In three examples, cases (16), (23), and (35) nervous symptoms were the only manifestations of the disease. In case (23) paresis of the left side of the palate occurred shortly before death but the brain was not examined at autopsy.

Enlarged glands were found on clinical examination in cases (1) and (23) but were not noted in any other of this series. Pleural effusion was present prior to admission to hospital or was discovered shortly after admission in twelve cases. Of these the effusion was copious in six instances and aspiration was repeated on several occasions in five cases. The fluid was haemorrhagic in four and purulent in two examples. As a terminal feature pleural effusion was common and in several instances where the fluid had been sterile growth was obtained by culture of specimens aspirated before death. Paralysis of one lobe of the diaphragm was recorded on radiological examination of case (11).

The clinical features of this series correspond fairly closely to those already studied. Pain which was noted in 60% occurred more frequently than is indicated in Table X (44%), but 36% of Hunt's series showed pain as the initial symptom. Haemoptysis (38%) and/
and fever (27%) are recorded less often than in the table (47% and 46% respectively) but the difference is probably due to a variation in the standard implied by these terms. Nervous symptoms (15%) and the proportion of cases in which these were the sole manifestation (9%) corresponding to the findings in Table X (20% and 13%), were due in each of the five examples to pressure on the spinal cord, and in no instance did they result from cranial metastasis. Contrary to the 16% of cases in which involvement of the recurrent laryngeal nerves was recorded above there is no record of vocal cord paralysis in this series. The incidence and types of pleural effusion are in agreement with the statements in the major part of this work.

**DURATION OF SYMPTOMS.**

The average duration of symptoms from the onset until admission to hospital was 23.5 weeks (6 months); the longest period was 2 years, case (15), and the shortest was 3 weeks, case (31). The average duration of symptoms until death was 27 weeks. The average period in hospital was 25 days; the longest 81 days, case (29), and the shortest 1 day, case (9). With regard to the pathological types the average duration of symptoms was 12.5 weeks for the two squamous carcinomata and 28 weeks for both columnar and oat cell groups.
DIAGNOSIS.

A provisional diagnosis was recorded prior to autopsy in twenty-nine cases. In thirteen a diagnosis of pulmonary neoplasm was noted. The remainder may be enumerated: - Mediastinal Tumour, 5; Tuberculosis, 4; Aneurysm, 2; Bronchitis and Heart Failure, 1; Malignant Pleural Effusion, 1; Gumma of Spinal Cord, 1; Tumour of Cord, 1; Carcinoma of Stomach, 1.

In twenty-six instances reports of the radiological examination are available. In the majority the condition had reached a stage at which the appearances of a tumour were masked by the secondary effects. In several cases the patient was too ill for radiography to be carried out. In a few the pulmonary lesion was not suspected and the chest was not X-rayed. In seven cases there was almost complete obscurity owing to the presence of pleural effusion or to diffuse tumour growth. Four cases showed evidence of some degree of collapse of the lung. Thirteen cases showed a shadow suggestive of neoplasm, most often at the hilum, some with associated atelectasis, or less commonly in the central area of the lung field.

Bronchoscopy was performed in only three cases. In case (15) a bronchogram had shown a filling defect of the bronchus and dilatation of the distal bronchi of/
of the lower right lobe two years before bronchoscopy was undertaken as a final measure in the treatment of asphyxia which was thought to have resulted from inspiration of a foreign body. The lower end of the trachea was then found to be obstructed by new growth. In case (25) bronchography showed stenosis of the left lower bronchus. This finding was confirmed by visualisation through the bronchoscope and it was thus possible for a diagnosis to be completed while the patient was in good condition and while the lesion was amenable to treatment. Bronchoscopy was carried out in case (51) and extensive bronchiectasis was observed. In this instance a tumour had arisen in the wall of a bronchiectatic cavity.

Examination of fluid aspirated from the pleural cavity did not play a striking part with regard to the diagnosis of the primary lesion. In a few instances endothelial cells were noted and growth was obtained on culture of the fluid.

The fact that accessory methods of investigation apart from clinical examination and simple radiography were employed in only three of this series may be attributed partly to the advanced stages of the condition. By the time some of the patients reached hospital such means would not have been of practical value.
TREATMENT.

Repeated aspiration of massive pleural effusion was carried out in five instances. Two cases, (21) and (22), were submitted to operation for empyema. In the former rib resection was performed, the lower lobe of the lung was found to be consolidated but no pus was evident in the pleural cavity. It was subsequently evident that exploration of the chest had resulted in aspiration of pus from a peripheral abscess in the lung. The patient went steadily downhill. In the second case an empyema cavity was drained nearly four months prior to the second operation at which the thick walled cavity was re-opened but no pus could be located. This patient died two days later.

Radical operation after thorough investigation had secured accurate diagnosis was attempted in one instance, case (25), of the whole series. Satisfactory exposure was completed at the first stage. The patient remained well for two weeks before the development of pneumonia in the other lung to which he succumbed five days later.

X-ray therapy was instituted in two cases. In one, case (11), two applications were given but the patient showed no response and continued to become weaker. No improvement was observed after similar treatment in case (29). There is no example of treatment by means of radium.
Even at death five cases in this series proved to be within the range of treatment on the lines already indicated in so far as the local condition was concerned. It may be assumed that in case (15) suitable treatment might have been effective at the time when the lesion was first identified two years before death. If bronchoscopy had been performed in case (7) the cause of the bronchiectasis, a localised pedunculated growth, would almost certainly have been discovered and might have been successfully dealt with. Similarly in case (2) where the tumour was localised to a bronchus, more complete investigation might have modified the issue. Cases (21), (22), and (25) have already been detailed. It is encouraging to note that six cases (18%) of this series were seen at a stage when the growth was localised and when there were no evident metastases. With more complete diagnosis treatment might have produced successful results. In others of this collection long delay before admission to hospital and consequently before investigation could be instituted was undoubtedly responsible for spread of the disease beyond the scope of treatment. For these reasons a plea may well be urged for greater recognition of the incidence of primary malignant disease of the lung and of the steps which should be taken in its diagnosis in order that treatment may be instituted not as a forlorn hope in advanced cases but as a successful measure in early lesions.
SUMMARY.

1. Thirty-five cases of primary intrathoracic cancer were submitted to post-mortem examination at the Royal Infirmary, Edinburgh, during the five years 1926-1931, and constituted more than 1% of all autopsies performed during that period. This series consisted of thirty-three examples of carcinoma of the lung and two cases of lymphosarcoma of which the clinical and pathological features have been analysed.

2. The average age of the cases of carcinoma was $53 \frac{3}{12}$ years. The age incidence of the oat cell types ($44 \frac{8}{12}$ years) was definitely less than that of the growths composed of more differentiated cells (55 years). The sex incidence was 81.8% males and 18.2% females. There was no evidence of special predisposing factors.

3. Carcinoma occurred with equal frequency on either side. Bronchiectasis was a common secondary effect and was found in 36% of the cases.

4. There were no extrathoracic metastases in nearly half of the series, and there were no metastases even to the mediastinal glands in 21% of cases, in some of which local growth was extensive and in a few involved both lungs. The oat cell type/
type showed much greater tendency to local extension and to distant metastasis. The pancreas was more commonly the site of secondary tumours than is usually noted, and conversely there is no instance of intracranial metastasis in this series.

5. The histological types were: squamous cell carcinoma - two cases; other differentiated forms (squamoid, columnar polygonal cell growths) - twelve cases; and the less differentiated types, including the oat cell tumours - nineteen cases. In most instances, whatever type the predominate cell may have been, transition stages and cells of greater and less differentiation were also evident. The same statement applied to the relation between primary and secondary growths.

6. The average duration of symptoms from the onset until death was about six months. Nearly half the cases began their course by "a chill". In more than half the onset was gradual with symptoms referable to the respiratory system and nervous symptoms were the only manifestation in three cases. In six (18%) of the series respiratory symptoms were never experienced, except as a terminal feature in a few, and in one instance where chill and haemoptysis were present only at the onset.
7. Cough was the commonest and earliest individual symptom. Haemoptysis was noted in less than half of the cases. Pleural effusion was a prominent feature in a third of the series and commonly occurred at the termination.

8. The average period in hospital was only twenty-five days, and in many of the cases the disease was too advanced to enable thorough investigation to be carried out. In only three cases routine clinical and radiological examination was supplemented by such accessory measures as bronchography and bronchoscopy. These means should be employed more frequently in order to achieve earlier and more accurate diagnosis.

9. One case was submitted to radical operation, two to the surgical treatment of complications, and two cases were treated by X-radiation. In no instance was cure effected. So far as the local condition appeared at autopsy, it seemed probable that six cases (18%) of this series had remained within the scope of treatment when in hospital.

10. Even at death one third of the patients were in a well nourished condition. It may be suggested that with earlier diagnosis appropriate treatment by surgery and radiation might have achieved success in a definite proportion of cases.
For permission to make use of their case records I am indebted to the Physicians of the Royal Infirmary, to Mr H. Wade for details of two, and to Mr J.M. Graham and Mr Bruce Dick for those of a third of the cases submitted to operation, and to Dr James Davidson for his kindness in placing the pathological material and reports at my disposal. The microphotographs are the excellent work of Mr T. Hamilton of the Royal College of Physicians Laboratory.